

**REMARKS**

This RCE is responsive to the final Office Action dated January 29, 2004, in which the Examiner rejects all the claims 1 – 16 as either being anticipated by Weinshall et al. (“*From Ordinal to Euclidean Reconstruction with Partical Scene Calibration*”, June 1988) or being obvious over Weinshall et al in view of Wilson et al. (US Patent No. 5,386,299). Applicants have amended claims 1-4, 6-7 and 11 to more clearly and precisely define the present invention, as well as deleted claims 13-16 for being substantially redundant of claims 7-10. Applicants respectfully disagree with the rejections of the Examiner based on the amended claims as well as the detailed explanation as below.

First of all, Applicants believe that a brief explanation of the present invention will be helpful in understanding the patentably distinguishing features of the present invention as claimed over the cited prior art. The present invention teaches a technique utilized in three-dimensional reconstruction based on two or more camera images, in which the coordinates (or depth) of an unknown point is obtained from two calibration markers whose coordinates (or only depths) are known. In particular, as taught by the present invention, the calibration of the setup is realized by generating in each camera an image corresponding to at least four points lying in a reference plane common to the respective images of the cameras, and then calculating a planar projective transform that maps the images of the at least four points to a reference frame which is a projection of the reference plane, as expressly defined in independent claims 1 and 11 claiming the inventive method. Thus, the coordinates (or depth - the distance from the reference plane) of an unknown point can be obtained from the two calibration markers whose coordinates (or only depths) are known, by mapping images of the unknown point and of the two calibration markers to the reference frame by the planar projective transform. Independent claim 7 is directed to a

three-dimensional reconstruction system for implementing the present invention, which comprises four reference markers lying in a common plane and two calibration markers visible to both cameras. With the present invention, the calibration procedure is very simple and requires no data input or high precision, and therefore is suitable for rapid and convenient setup.

Applicants respectfully disagree with the assertion of the Examiner that the present invention as defined in independent claims 1 and 11 are anticipated by Weinshall et al ("*From Ordinal to Euclidean Reconstruction with Partial Scene Calibration*", June 1998). Weinshall et al discloses a stratified approach to projective constructions in which gradual increase in domain information for scene calibration leads to gradual increase in three-dimensional information. Unlike the assertion of the Examiner, however, Weinshall et al does not teach the features of the calibration steps as defined in claims 1 and 11. In particular, it cannot be found anywhere in Weinshall et al a teaching or implication that the reconstruction or calibration procedure comprises steps of "generating in each camera an image corresponding to at least four points lying in a reference plane common to the respective images of the cameras, and calculating a planar projective transform that maps the images of the at least four points to a reference frame which is a projection of the reference plane", as expressly defined in claims 1 and 11. In other words, Weinshall et al never teaches to map the images of at least four points lying in a reference plane to a reference frame so as to calculate the planar projective transform, which will be used for mapping images of the two known calibration markers and the unknown point to the reference frame so as to compute the position of the unknown point. Moreover, it is noted that what Weinshall et al teaches is to breakdown the projection into two operations. Firstly, the scene is projected through each camera center onto the reference plane, and then the reference plane is mapped to the image plane of the camera (see page 210, paragraph 4). There is no reference

frame involved. In other words, Weinshall never teaches to map the images to a reference frame which is a projection of the reference plane as defined in claims 1 and 11. In addition, unlike the assertion of the Examiner, it cannot be found anywhere in Weinshall a saying or implication that the “four points” mentioned in page 209 is lying in the reference plane.

Therefore, Applicants submit that independent claims 1 and 11 are not anticipated by Weinshall et al under 35 USC §102(b), and are thus patentable. At least for the same reasons, dependent claims 2 – 6 and 12 are also patentable as each of them includes all the limitations of either claim 1 or 11.

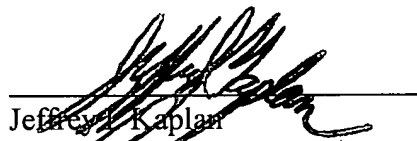
Similarly, Applicants respectfully disagree with the assertion of the Examiner that claim 7, which is directed to a three-dimensional reconstruction system, is obvious over Weinshall et al in view of Wilson et al (US Patent No. 5,386,299). In particular, neither Weinshall nor Wilson teaches or discloses to generate images of at least four points lying in a reference plane to calculate planar projective transform for mapping to a reference frame. Therefore, Applicants submit that claim 7 is not obvious over the combination of Weinshall and Wilson under 35USC §103(a), and is thus patentable. At least for the same reasons, dependent claims 8-10 are also patentable as each of them includes all the limitations of claim 7. In particular, dependent claim 8 further defines that “the four reference markers are corners of an aperture in a screen”, and dependent claim 9 further defines that “the four reference markers are projected onto a screen”, which cannot be found anywhere in either Weinshall or Wilson. Therefore, the patentability of dependent claims 8 and 9 is further strengthened.

Therefore, Applicants respectfully request reconsideration and allowance in view of the amendments and the remarks. The Examiner is authorized to charge any shortages or credit any overpayments to our Deposit Account No. 11-0223.

Respectfully submitted,

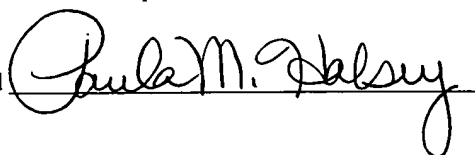
KAPLAN & GILMAN, L.L.P.  
900 Route 9 North, Suite 104  
Woodbridge, NJ 07095  
Telephone (732) 634-7634

DATED: March 4, 2004

  
\_\_\_\_\_  
Jeffrey T. Kaplan  
Reg. No. 34, 356

**CERTIFICATE OF MAILING**

I hereby certify that this correspondence is being deposited with the United States Postal service as first class mail, in a postage prepaid envelope, addressed to Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on March 4, 2003.

Dated March 4, 2004 Signed  Print Name Paula M. Halsey